**Answer on Question #74006, Physics / Mechanics | Relativity**

**Question.** A hot air balloon is rising straight up at a constant speed of $7.0\ m/s$. When the balloon is $12.0\ m$ above the ground, a gun fires a pellet straight up from ground level with an initial speed of $30.0\ m/s$. Along the paths of the balloon and the pellet, there are 2 places where each of them has the same altitude at the same time. How far above the ground are these 2 places?

**Given.** $v = 7.0\ m/s;\ h_0 = 12.0\ m;\ u = 30.0\ m/s.$

**Find.** $h_1, h_2 - ?$

**Solution.**

For a hot air balloon

$$h = h_0 + vt.$$

For a pellet

$$s = ut - \frac{gt^2}{2}.$$

$$h = s \ \rightarrow \ h_0 + vt = ut - \frac{gt^2}{2}$$

$$12 + 7t = 30t - \frac{9.8t^2}{2} \ \rightarrow \ 4.9t^2 - 23t + 12 = 0 \Rightarrow t_1 = 0.6\ s;\ t_2 = 4.1\ s.$$

Hence

$$h_1 = 12 + 7 \cdot 0.6 = 16.2\ m;$$

$$h_2 = 12 + 7 \cdot 4.1 = 40.7m;$$

**Answer.** $h_1 = 16.2\ m;\ h_2 = 40.7m.$